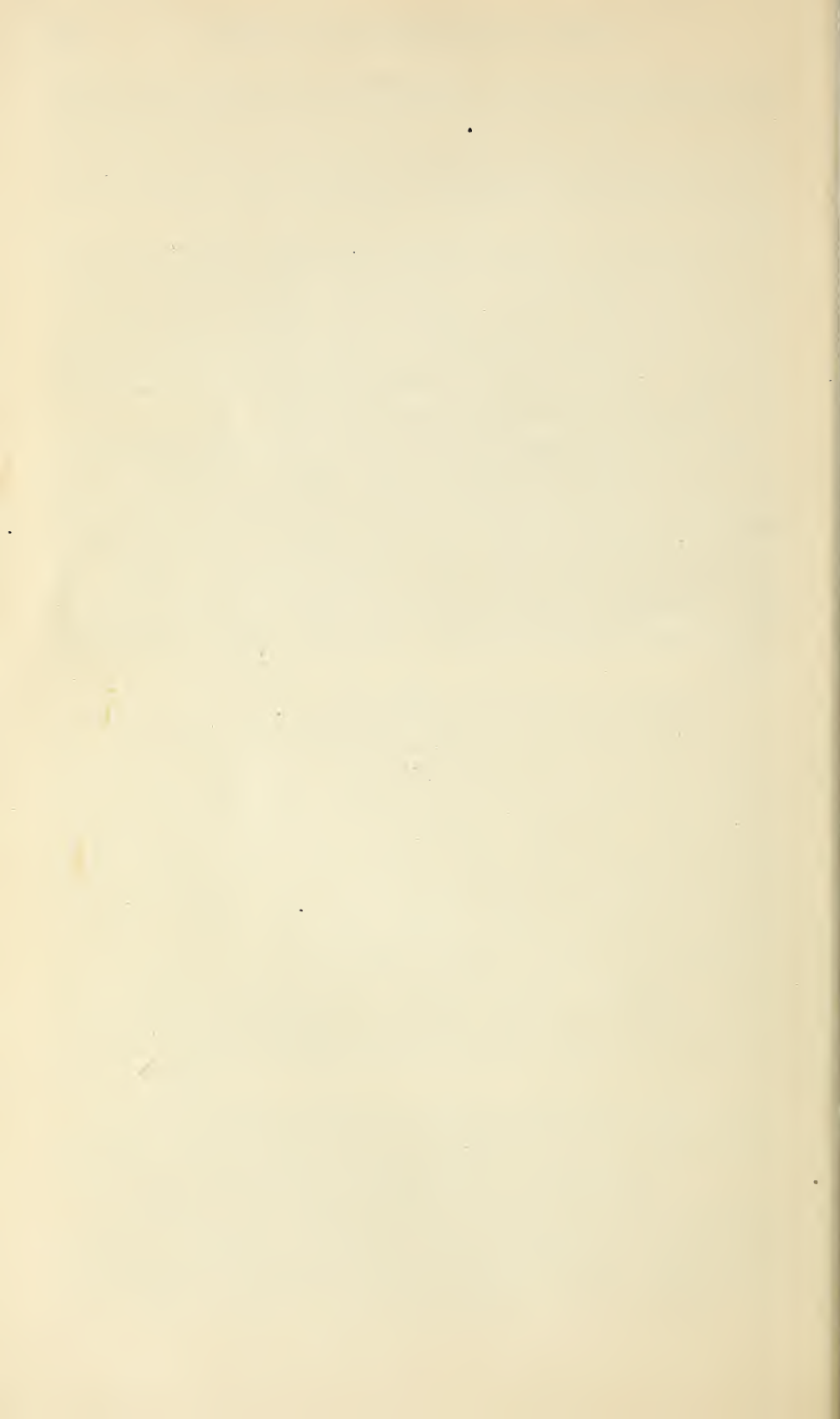


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# PROPOSED FARM POWER STUDIES

AS OUTLINED BY THE FARM POWER CONFERENCE  
AND THE DEPARTMENTAL COMMITTEE  
ON FARM POWER PROJECTS



UNITED STATES DEPARTMENT OF AGRICULTURE  
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## PROPOSED FARM POWER STUDIES

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A general conference on farm power problems, participated in by representatives of the United States Department of Agriculture and of State colleges and various agricultural and trade organizations concerned, was held in Chicago on October 6 and 7, 1919. This conference submitted a report to the Secretary of Agriculture, in which it was recommended that Congress be asked to make adequate appropriations for fundamental studies of farm power problems, to be undertaken by the United States Department of Agriculture in cooperation with the State colleges. Pursuant to these suggestions, Secretary Houston appointed a committee, consisting of Thomas H. MacDonald, chief of the Bureau of Public Roads; George M. Rommel, chief of the Animal Husbandry Division of the Bureau of Animal Industry; and H. C. Taylor, chief of the Office of Farm Management (chairman), to take charge of the farm-power projects of the Department of Agriculture. In the following pages are presented the report of the Chicago conference and the suggestions of the departmental committee as to the farm power studies that should be undertaken by the department.

In transmitting their suggestions to Secretary Houston the committee called attention to the fact that it was the open expression of the conference—

1. That each of the forms of farm power has its place.
2. That the central problem is that of ascertaining the respective fields in which each form of power can be used, and the relative profitableness of the different forms in the fields in which they compete.
3. That it is necessary to provide official ratings for tractors, and that these should be Federal rather than State ratings.
4. That it is desirable to institute studies to determine the working rate of horses as affected by various factors existing under farm conditions.

Congress has been asked for funds to carry on investigations in farm power problems as outlined by the committee on the basis of the suggestions of the Chicago conference. If appropriations are made accordingly, work will be begun as soon as funds are made available.

It is proposed that the department shall cooperate with the various State colleges in this work in all cases in which arrangements can be made for joint investigations.

## REPORT OF CHICAGO CONFERENCE

CHICAGO, ILL., October 7, 1919.

The Honorable, the SECRETARY OF AGRICULTURE.

DEAR MR. SECRETARY: Your committee on farm power held a conference October 6 and 7 at the New Morrison Hotel, Chicago, Ill.

During the deliberations, the various interests (i. e., farmers, horse breeders, tractor and implement manufacturers, saddlery and feed-producer representatives, and workers from farm management, animal husbandry, and agricultural engineering departments of the agricultural colleges), together with representatives of interested bureaus of your department, had opportunity to present their views and to emphasize the important and immediate problems relating to farm power.

The most urgent problem before the American public to-day is that of lowering the high cost of living, and the key to this in American agriculture is to be found in increased and more economic production, which we believe will come chiefly through a more efficient and more complete utilization of farm power.

We believe further that the more general introduction of power in the farm home will be one of the most important factors in contributing to a more satisfying home and social life.

It was clearly set forth in the discussion that there are many complex power problems which need the attention and immediate consideration of the United States Department of Agriculture and the agricultural colleges.

We are also pleased to report that the various interests represented in this conference pledged to the United States Department of Agriculture their hearty and active cooperation in the carrying on of investigations, demonstrations, and other work connected with the farm power problems.

It is urged that the Department of Agriculture, in cooperation with the State agricultural colleges and experiment stations, inaugurate and carry out the studies and investigations outlined below:

## ECONOMIC FACTORS

The economic factors of farm power problems should be considered under the following heads:

## I. Farm power requirements:

## a. Field operations—

1. Plowing.
2. Disking.
3. Harrowing.
4. Seeding.
5. Hay harvesting.
6. Grain harvesting.
7. Corn harvesting.

## b. Hauling—

1. Road.
2. Farm.

## c. Heavy belt work.

## d. Small power operations.

## II. Animal power:

- a. Size of animal units.
- b. Cost of maintenance.
- c. Total utilization.
- d. Reducing unit costs.
- e. Quality of work.

## III. Mechanical power:

- a. Type of power unit.
- b. Size of unit.
- c. Cost of maintenance.
- d. Total utilization.
- e. Displacement of animal power.
- f. Effect of type and size of horses and mules maintained.
- g. Adaptation of available machinery.
- h. Quality of work.

## IV. Relation of forms of farm power to man labor:

- a. Effectiveness of labor utilization.
- b. Seasonal demands for labor.
- c. Effect of time and weather limitations.
- d. Cost of man labor—
  1. Rate per hour.
  2. Enterprise labor cost.
- e. Quality of labor required.

## V. Influence on the farm organization and operation:

- a. Size of farm.
- b. Size of fields.
- c. Topography of farm.
- d. Character of soil.
- e. Type of farming.
- f. Combination of crop and live-stock enterprise.
- g. Intensity of culture.
- h. Total farm profits.

## Methods of study:

- a. Detailed cost accounting studies of the entire farm business.
- b. Farm management surveys.
- c. Enterprise studies of the tractor and its operation.

These three methods are all useful and supplement each other in providing satisfactory data on the farm power problem.

## ANIMAL POWER

The animal power factors suggested for study and investigation are as follows:

1. Working rating of horses as affected by various factors existing under farm conditions.
2. Cost of the horse as a source of power, the cost to be expressed in terms of food, labor, materials, etc., considering all proper charges and credits.
3. Economy and efficiency of the horses as a source of power.
4. How farm power needed for peak-load periods can be most advantageously supplied.
5. Practical methods of securing the greatest possible utilization of power available from farm horses.

## MECHANICAL POWER AND EQUIPMENT

Under the heading of mechanical power and equipment the following subjects are suggested for study and investigation:

1. Belt, draw-bar, and fuel economy tests of farm tractors.
2. The power requirements, efficiency, and possibilities of operation in combination of all types of farm machines and implements.
3. Causes of successes and failures in farm machines.
4. Education in the use and care of farm equipment.
5. Service to owners of machines.



6. Adaptability of machines.
7. Development of new implements.
8. Such problems as the uniform and proper speeds of belt travel, of uniform and proper speeds of operation of farm implements, of uniform and proper grouter equipment for farm tractors, and such other matters touching the construction, use, and operation of farm implements as do not affect the type of fundamental design of any products as manufactured.
9. Use of power in the farm home.

#### RESOLUTIONS AND RECOMMENDATIONS

Whereas the problems of farm power are materially influenced by State and local conditions; and

Whereas the State agricultural colleges are interested in those questions and are in close touch with the agricultural interests of the States, and are prepared or can easily be prepared to assist in solving these problems:

*Be it resolved*, That it is desirable that the United States Department of Agriculture should cooperate as far as possible with the State colleges in carrying on work connected with farm power and other agricultural engineering problems; and

*Be it resolved*, That we urgently recommend that Congress be asked to make adequate appropriations for fundamental studies of the farm power problem, and that when appropriations become available for this purpose, the investigations be planned by a committee of the ablest men available.

Unanimously adopted:

G. A. BELL, *Animal Husbandry Division, United States Department of Agriculture.*

S. H. BELL, *Bell Bros., importers and Exporters of Horses.*

L. W. CHASE, *University of Nebraska.*

G. I. CHRISTIE, *Superintendent of Agricultural Extension, Purdue University.*

J. B. DAVIDSON, *Agricultural Engineering Department, Iowa State College.*

WAYNE DINSMORE, *Secretary of the American Percheron Society of America.*

A. L. EDMONDS, *Division of Horse Husbandry, University of Illinois.*

J. I. FALCONER, *Chief, Department of Rural Economics, Ohio State University.*

E. J. GITTENS, *J. I. Case Thrashing Machine Co., Racine, Wis.*

HOWARD GREEN, *farmer, Genesee Depot, Wisconsin.*

W. H. HANDSCHIN, *Chief, Farm Organization and Management, University of Illinois.*

E. A. JOHNSON, *International Harvester Co.*

THOS. H. MACDONALD, *Chief, Bureau of Public Roads, United States Department of Agriculture.*

E. B. McCORMICK, *Chief, Division of Rural Engineering, Bureau of Public Roads, United States Department of Agriculture.*

H. B. MUNGER, *Chief, Farm Management, Iowa State College.*

WALTER J. MUNRO, *Green, Fulton, Cunningham Co., saddle manufacturers, Detroit, Mich.*

ED. E. PARSONAGE, *Deere & Co., Moline, Ill.*

F. W. PECK, *Cost of Production Section, Office of Farm Management, United States Department of Agriculture.*

G. A. RANNEY, *International Harvester Co.*

G. M. ROMMEL, *Chief, Animal Husbandry Division, Bureau of Animal Industry, United States Department of Agriculture.*

H. C. RAMSOWER, *Agricultural Engineering, Ohio State University.*

E. RAUCHENSTEIN, *University of Illinois.*

LYNN S. ROBERTSON, *Assistant in Farm Management Demonstration, Purdue University.*



J. H. SHEPPERD, *Animal Husbandry Department, North Dakota Agricultural College.*

H. C. TAYLOR, *Chief, Office of Farm Management, United States Department of Agriculture.*

J. V. TAYLOR, *National Hay Association.*

GEO. WILBUR, *Farmer, Marysville, Ohio.*

R. H. WILCOX, *Office of Farm Management, United States Department of Agriculture.*

E. A. WHITE, *Research and Engineering Department, Holt Manufacturing Co., Peoria, Ill.*

F. A. WIRT, *Maryland State College.*

J. O. WILLIAMS, *Animal Husbandry Division, United States Department of Agriculture.*

### REPORT OF COMMITTEE OF FARM POWER PROJECTS

The committee appointed for outlining farm power projects for the Department of Agriculture has drawn up seven projects, as follows:

1. The testing and rating of farm tractors.
2. The determining of the working rating of horses.
3. The measurement of power requirements of machines and implements.
4. The development of practical methods of expanding the power of farm horses.
5. The determination by field studies of the mechanical efficiency of horses as power units.
6. The increasing of the economic efficiency of horse and tractor power by the readjustment of the size of the farm and the combination of enterprises.
7. The compiling of accurate data concerning farm power demands and the relative cost of meeting these demands by the various kinds of power on farms.

1. *The testing and rating of farm tractors.*—This project will include field and laboratory tests for the purpose of determining the belt or brake horsepower and the drawbar horsepower as well as the fuel consumption of the tractor. These tests will be made under varying load conditions, probably at half and full load as rated by the manufacturer and also at maximum load that can be developed. The tractors will be operated at the speeds recommended by the manufacturer. There will be an endurance test for the purpose of showing any defects that may exist and also to determine whether the rated load can be secured under conditions of continuous operation. It is proposed to issue a card showing the rating of tractors.

2. *The determining of the working rating of horses.*—Under this project it is proposed to make controlled tests to determine the possibilities and limiting factors relating to the consideration of the generation of power by horses of different types. When such preliminary work has been so far carried out as to indicate in some measure what type of horse is most efficient as a power unit, teams of such types should be studied in adequate numbers at different points to determine the extent to which age, weight, temperament, sex, condition, soundness, climate, topography, overload, speed, and feed affect the efficiency of horses as power units.

3. *The measurement of power requirements of machines and implements.*—Studies will be carried on to determine the power required to operate principal types of field and stationary machinery under varying conditions arising in farming practice. Plows and other tillage implements will be operated in connection with a dynamometer and the power required to pull the given sizes in various kinds of soil and at different depths of tillage will be determined. Stationary machines, such as ensilage cutters, feed grinders, grain separators, etc., will be tested to determine the power that must be delivered to the belt wheel of the machine and the most effective speed of operation.

4. *The development of practical methods of expanding the power of farm horses.*—This study has to do with the economy, efficiency, and the more complete utilization of the horsepower existing on the farm, including the use of 4-, 6-, and 8-horse teams in most efficient ways and the utilization of horses in every possible way as auxiliary power units, including the use of hitches of various kinds and the use of large machinery, such as 2- and 3-bottom gang plows, double-disk harrows, culti-packers, 2-row cultivators, large mowers, rakes, binders, and hay loaders.

5. *The determination by field studies of the mechanical efficiency of horses as power units.*—The mechanical efficiency of horses as power units can be determined best by the application under field conditions of the principles worked out under projects 2 and 4.

6. *The increasing of the economic efficiency of horse and tractor power by the readjustment of the size of the farm and the combination of enterprises.*—This project contemplates the use of the farm data gathered by the survey and cost accounting methods to show the relation of the various forms of farm power to—

1. Total farm profits.
2. Utilization and distribution of man labor.
3. Peak-load and slack labor demand periods on the farm.
4. Utilization of the farm area by various combinations of crops.
5. The increasing and decreasing of the total farm area due to the use of farm power.
6. The establishment and maintenance of live-stock enterprises on the farm.

7. *The compiling of accurate data concerning farm power demands and the relative cost of meeting these demands by the various kinds of power on farms.*—This work will be concerned with studies of the requirements for power at various seasons for different types of farming. The data collected will show the amount and kind of power used throughout the year and the cost of performing specific operations by the different forms of power. The cost has a direct influence on the total farm profits which is the economic basis for the choice of power.



